NATIONAL VOCATIONAL TRAINING INSTITUTE

TRADE TESTING

TRADE TESTING REGULATIONS AND SYLLABUS

TRADE: INDUSTRIAL MAINTENANCE

LEVEL: CERTIFICATE TWO

TRADE TEST CERTIFICATE ONE

A. INTRODUCTION

i. The review of this syllabus has been generally influenced by the demands of industries due to its continuous change as a result of technological advancement and the changing needs of society. It was also influenced by the TVET reforms under the directions of the new educational reforms with the view to opening up further education and training opportunities to TVET graduates. The certificate ONE syllabus is designed to respond to the following level descriptors:

QUALIFICATION	KNOWLEDGE LEVEL	SKILLS AND ATTITUDE:
Certificate 1	1. To demonstrate a broad knowledge base incorporating some technical concepts. 2. To demonstrate knowledge of the theoretical basis of practical skills. 3. To demonstrate knowledge in numeracy, literally, IT and Entrepreneurial skills	1. Require a wide range of technical skills 2. Are applied in a variety of familiar and complex contexts with minimum supervision. 3. Require collaboration with others in a team

ii. Knowledge in the safe use of Industrial maintenance equipments and fittings, trade drawing, science and calculations

B. GENERAL OBJECTIVES

On completion of this course, the trainee should be able to:

i) Acquire the requisite knowledge, skills and attitude for far further Technical and Vocational Education and training
ii) Acquire the techniques for solving problems in mechanical field
iii) Acquire skills and knowledge in operating industrial machines
iv) Develop positive attitude towards application of practical skills, safe use of tools, judicious use of materials and time in the workshop and on site

C. THE COURSE COMPRISES

Trade Theory
Trade Science and Calculation
Trade Drawing
General Paper
Practical work

Practical work must be carefully planned to illustrate application of the theory and to provide maximum opportunities for shop practice, laboratory work and demonstration.

D. KNOWLEDGE AND SKILLS REQUIREMENT

The prime objective of the programme is to provide knowledge and skills of the trade in a manner that will best meet the needs of the trade as well as industries using maintenance tools.

E. ENTRY TO THE COURSE

Minimum education : Must have passed JHS or SHS examination. However, the selection of trainees for the course is within the discretion of the Head of the Institution.

F. ELIGIBILITY FOR ENTRY TO EXAMINATION

Candidates may enter for examination only as internal candidate that is those who at the time of entry to the examination are undertaking (or have already completed the course at an approved establishment).

G. EXTERNAL EXAMINERS

The practical work of candidates will be assessed by an external examiner appointed by the Trade Testing Commissioner.

H. EXAMINATION RESULTS AND CERTIFICATES

Each candidate will receive record of performance given the grade of performance for the components taken. These are:

i) Distinction
ii) Credit
iii) Pass
iv) Referred/Fail

All Technical and Vocational trainees who aspire to take advantage of the opportunities opened to them in the educational reforms should NOTE that for a trainee to progress to certificate Two (2) a pass in Certificate One (1) is required.

I. APPROVAL OF COURSE

Institutions or other establishments intending to prepare trainees for the Examination must apply to
THE COMMISSIONER
TESTING DIVISION
NVTI, HEAD OFFICE
P.O. BOX MB 21, ACCRA

NOTE

All Technical and Vocational trainees who aspire to take advantage of the opportunities opened to them in the educational reforms should NOTE that, for a trainee to progress to certificate Two (2) a pass in Certificate One (1) is compulsory.

H. ACKNOWLEDGEMENT

NVTI wishes to acknowledge the preparatory material done by the team of experts, which have been incorporated into this syllabus.

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Government's desire to improve the lot of Technical/Vocational Training, which led to the preparation of this syllabus, is hereby acknowledge.

THE RECOMMENDED TEXT BOOKS

1. Fundamentals of service for power trains – By F.E.W.
2. Theory and Practice of Metal Craft by John R. Bedford
3. Fitting Practice and Benchworks by F.D-K Agbofa
4. Engineering Training Guide by F.D-K Agbofa
5. Precise Maintenance and Work Services by F. D-K Agbofa
6. Workshop Theory – 3rd Edition by Vincent Austin
7. Greer and Howell Book 1&2
8. Metal Work for Senior High Schools by E.A. Teye & G. Amekuedi

RECOMMENDED TEXT BOOKS – TRADE DRAWING

1. Engineering Drawing by I.S. Vyshnepolsky
2. Geometric and Engineering Drawing – 2nd Edition by K. Morling
3. Geometric and Engineering Drawing by Pickup & Parker

RECOMMENDED TEXTBOOKS – TRADE SCIENE AND CALCULATIONS

1. Mechanical Engineering Craft Studies book 1&2 by A. Greer and H. Howell
2. Engineering Science by Calendarman
3. Core Science for SSSS by Aki-Ola Series
4. Core Mathematics for SSSS by Aki-Ola series
5. Engineering Science by T.A. Fletcher (TAF Series)
6. Engineering Science Akron Series
7. Engineering Science by Approachers Series
8. Practical Core Mathematics for Senior High School and Colleges – Calendar – Man Series by Isaac Nyarko Asare

TOOLS AND EQUIPMENT
FITTING – CAT. A

1. Sensitive drilling machines
2. Pillar drilling machines
3. Column drilling machines
4. Radial drilling machines
5. Heat treatment furnace and accessories
6. Morse taper sleeves (all sizes)
7. Set of drills (parallel shanks)
8. Taper shank drills (all sizes)
9. Screw pitch gauges (metric and imperial)
10. Screw angle gauges (metric and imperial)
11. Centre lathes
12. Blacksmith forge (electric type)
13. Machine nices (all sizes)
14. Drill chucks and keys (all sizes)
15. Electric hand drills (all sizes)
16. Angle grinders (all types and sizes)
17. Grind machines (all types)
18. Gas welding machine with accessories
19. Arc welding machine with accessories
20. Soldering equipment (Hard and soft)
21. Riveting sets
22. Mig-mag welding sets
23. Rectifiers (AC and DC)
24. Plate bending machine
25. Pipe threading and cutting machine
26. Centre lathe with accessories

FITTING: CAT. B

1. Vices 150mm
2. Benches
3. Hacksaw
4. Files (all types and grades/cuts)
5. Steel rules (150mm & 300mm)
6. Tape measure 300mm
7. Dividers
8. Scribers
9. Centre punches
10. Dot punches
11. Vernier calipers (150mm & 300mm)
12. Hammers (all types and sizes)
13. Oil can
14. Pair of pliers (all types and sizes)
15. Odd-leg calipers
16. Inside & Outside calipers (spring and firm)
17. Engineers try-square
18. Screw drivers (all types and sizes)
19. Snip cutters (all types and sizes)
20. Hand vices
21. Tools boxes with locks
22. Set of spanners (all types and sizes)
23. Set of taps and wrenches (all types and sizes)
24. Set of stocks and dies (all types and sizes)
25. Scrapers (all types)
26. Reamers (all types and sizes)
27. Vee blocks (pairs) 100mm x 100mm & 200 x 100mm
28. Surface plates (500mm x 500mm)
29. Marking-out tables (1200mm x 12000mm)
30. Engineers anvil
31. Vernier height gauge
32. Dial test indicators
33. Pairs of parallel stripes (all sizes)

34. Micrometers (all types and sizes)
35. Protractors (all types and sizes)
36. Chisels (all types and sizes)
37. Drifts
38. Tongs (all types)
39. Tap extractors
40. Circlip pliers (internal and external)
41. Pipe wrenches (all sizes)
42. Self grip wrenches
43. Pipe bender
44. Guillotine machine (manual/power operated)
45. Engineers spirit level

CERTIFICATE TWO – TRADE THEORY

TASK		CRITICAL POINTS	SUB-POINTS	INSTRUCTIONAL TECHNIQUES
1.0	SAFETY MEASURES	1.1.1 Safety measures in the workshop	Types of safety measures in the workshop	Demonstrate safety measures with the trainees with real objects
		Applying safety measures in the workshop		
		Hazardous conditions in the environment	Hazardous conditions in the workshop	Discuss the hazardous conditions with trainees.
		The dangers associated with flammable materials in the workshop	The dangers associated with flammable materials in the workshop	Demonstrate dangers associated with flammable materials in the workshop with real objects.
		The correct codes in marking and handling gas cylinders	The code marking on cylinders	Lecture and demonstrate the correct codes in marking and handling gas cylinders.
		Dangers associated with the use of electricity	The dangers associated with the use of electricity	Lecture/Identification
		Reasons for guiding dangerous parts of equipment in the workshop	Dangerous areas of workshop equipment needed for guarding	Discuss the reasons of guarding dangerous parts of equipments
		Safety practices when lifting and moving objects	Safety practices when lifting and moving objects	Demonstrate safety practice with lifting and moving objects
2.0	INDUSTRIAL FASTENERS	2.1.1 Industrial fasteners	Types of industrial fasteners	Show real objects
		2.1.2 Screws fasteners	Areas where fasteners are applicable	Discuss with students the application of screw fasteners.
		2.1.3 Types of rivets	Types of rivets	Display real object
		2.1.4 Application of rivets	Situations where fasteners are applicable	Discuss method and application with trainees.
		2.1.5 Classify materials for construction of rivets.	Materials for construction of rivets	Display materials and guide trainees to classify them.

CERTIFICATE TWO – TRADE THEORY

TASK		CRITICAL POINTS	SUB-POINTS	INSTRUCTIONAL TECHNIQUES
3.0	SEAL AND GASKET	3.1.1 Differentiate seals from gaskets	Seals from gaskets	Display real objects and assist trainees to differentiate
		3.1.2 Application of seals and gasket	Types of seals and gasket	Trainees to visit workshop to examine different types of seals and gaskets and their applications
		3.1.3 Cleaning, inspection and storage of seals and gasket	Methods of cleaning, inspection and storing seals and gaskets	Guide trainees to clean, inspect and store seals and gaskets
		3.1.4 Differentiate dynamic seals from static seals	Dynamic seals and static seals	Display objects and assist trainees to separate dynamic seals from static seals
4.0	BEARINGS	4.1.1 Bearings (Friction and anti friction)	Types of bearings	Show real objects to trainees and help them to come out with their names
		4.1.2 Differentiate ball bearing from roller bearing	Ball bearings and roller bearings	Show real objects to trainees to observe
		4.1.3 Materials used for construction of anti-frictional bearings from holes and on shafts.	Materials used for anti-frictional bearings	Display real objects and discuss
		4.1.4 Basic factors in selecting bearings	Types of basic factors in selecting bearings.	Discuss the basic factors for bearing selection
		4.1.5 Classify bearing loads	Types of bearing loads	Discussions
		4.1.6 Mounting and removal of bearing	Methods of mounting and removal of bearings .	Lecture and demonstration
		4.1.7 Types of plain bearings manufacturing	Types of plain bearings	Real objects and discussion
		4.1.8 Materials for plain bearings manufacture		Show real objects and discussion
		4.1.9 Methods of reconditioning journal bearings	Methods of reconditioning journal bearing	Discussion/demonstration

CERTIFICATE TWO – TRADE THEORY

TASK		CRITICAL POINTS	SUB-POINTS	INSTRUCTIONAL TECHNIQUES
		4.1.10 Asses symptoms of bearings failure	Symptoms of bearing failure	Lecture and analyse
		4.1.11 Test bearings for wear	How to check bearing for wear	Show real objects and identify the wear on bearings
5.0	LUBRICATION	5.1.1 The purpose of lubrication	Tabulate the purpose of lubrication	Discussion and demonstration methods
		5.1.2 Outline factors to determine in Selecting a lubricant	Factors when determining the selection of a lubrication	Lecturing and illustrations
		5.1.3 Enumerate functions of lubrications	Functions of lubricants	Discussions Demonstration
		5.1.4 Outline factors of lubrication theory	Factors of lubricants	Discussions
		5.1.5 The viscosity of lubrication	Viscosity of lubricants	Lecturing
		5.1.6 Enumerate common terms associated with lubrication	Terms connected to lubricating	Discussion
		5.1.7 Outline lubrication system	Lubricating system	Discussion
		5.1.8 Differentiate types of grease	Types of grease	Lecturing
		5.1.9 Compare the advantages and disadvantages of oil in relation to grease	The advantages and disadvantage of oil and grease	Discuss Charts
		5.1.10 Asses proper storage of oil and grease	Storage of oil and grease	
		5.1.11 Outline safe methods of handling lubricants	Methods of handling lubricants	

CERTIFICATE TWO – TRADE THEORY

TASK		CRITICAL POINTS	SUB-POINTS	INSTRUCTIONAL TECHNIQUES
6.0	SHAFT	6.1.1 Standard qualities of shafts	Standard qualities of shafts	Real objects and discussion
		6.1.2 Materials for manufacturing of shafts	Materials for manufacturing shaft	Real objects
		6.1.3 Outline forces that act on line shafts when in motion	Forces that act on shafts when in motion	Lecturing and demonstration
		6.1.4 Importance of shaft diameter being machined to close tolerance	Importance of close tolerance of shaft diameter	Lecturing Discussion
7.0	ASSEMBLING AND DISASSEMBLING TOOLS	7.1.1 Assembling and disassembling tools	Assembling and disassembling tools	Show real object and brainstorm
8.0	LOCKING DEVICE	8.1.1 Classify locking device	Types of locking device	Show charts and real objects
9.0	POWER TRANSMISSION	9.1.1 Explain the term power transmission	Types of power transmission	Show real object and brainstorm
9.1	GEAR DRIVE	9.1.2 Types of gear drive	Various parts of gears	Real objects and discussion
		9.1.3 The materials for gear manufacturing	Gear profile	Real object
		9.1.4 Gear profile	The conditions for a pair of gears meshing	Discussion
		9.1.5 Conditions for a pair of gear to mesh	Pair of gear meshing	Demonstration
		9.1.6 Checking gears for backlash	Causes of backlash in gears system	Demonstration
		9.1.7 Differentiate simple gear train from compound gear train	Advantages and disadvantages of gear trains	Show real object
		9.1.8 Types of various chain drive	Various parts of chain drive	Display real objects for observation
		9.1.9 Materials for manufacturing of chains	Properties of materials for chain manufacturing	Discussions

CERTIFICATE TWO – TRADE THEORY

TASK		CRITICAL POINTS	SUB-POINTS	INSTRUCTIONAL TECHNIQUES
		9.1.10 Determining the centre distance of the roller chain	Dimensions associated with roller chain	Display real objects for observation
		9.1.11 Various sizes of sprocket	Size of sprocket	Show real objects
		9.1.12 Materials used for manufacturing of sprocket	Properties of materials for manufacturing sprockets	Lecturing
		9.1.13 Faulty chains	Causes of damages	Display real objects for observation and diagnosing
9.2	BELT DRIVE	9.1.15 Various types of belts Factors to determine the choice of particular belt.	Types of belt drives Discuss how belt arrangement affects direction of drive	Visit workshop to observe real objects
		9.1.16 Factors that determine grip of belt	Tabulate factors that determine grip of belts	Demonstrate
		9.1.17 Cross-section of belts	Various cross-section of belts	Display real objects and sketch.
10.0	COUPLINGS	10.1.1 The term coupling	Types of coupling	Real object observation with explanation
		10.1.2 Enumerate the advantages and the disadvantage of couplings	The advantages and the disadvantages of coupling	Lecture and discuss
		10.1.3 Application of couplings	Various types of couples and their uses	Show real objects for observation
		10.1.4 The operation of fluid coupling	Operations of fluid coupling	Lecture, discuss and industrial visit
		10.1.5 Reasons for checking alignment of coupling	Importance of checking alignment	Demonstration

CERTIFICATE TWO – TRADE SCIENCE AND CALCULATION

TASK		CRITICAL POINTS	SUB-POINTS	INSTRUCTIONAL TECHNIQUES
1.0	HEAT AND TEMPERATURE	1.1.1 Differentiate heat from temperature Effect of heat on materials	Explain the effect of heat on materials	Lecturing and discussions
		1.1.2 Heat transfer through solid, medium and space	Explain the means by which heat is transferred	Lecturing and discussions
		1.1.3 Unit of heat Calculation of heat energy	State the unit of heat	Lecturing and discussions
2.0	FORCES	2.1.1 Effect of force	Identify effect of force List effect of force	Lecturing and discussions
		2.1.2 Units of force	List units of force	Lecturing
		2.1.3 Applications of forces on objects	List various application of force	
		2.1.4 Types of forces	State types of forces	Discussions
		2.1.5 Calculation of forces	Tabulate method of force	Demonstrations
3.0	MATERIALS	3.1.1 Effect of force on materials	State effects of forces on materials	Lecturing and discussions
		3.1.2 Effect of heat on materials	Explain the effects of heat on materials	Lecturing and discussions
		3.1.3 Calculation of forces on materials	Explain the effect when force is applied on solid materials.	Lecturing/discussions and demonstration
		3.1.4 Application of forces to solid materials		
4.0	THE PRINCIPLES OF MOMENTS	4.1.1 The turning effect	Explain turning effect of forces	Lecturing and discussions
		4.1.2 The fulcrum	Illustrate the fulcrum	Discussions and illustration
		4.1.3 State of equilibrium condition	Explain state of equilibrium condition	Lecturing and demonstrations
		4.1.4 Calculate moment of force	Applying clockwise moment equals to anti-clockwise principle	Lecturing and illustrations
		4.1.5 Simple levers mechanism	Explain simple levers mechanism	Lecturing and discussions
		4.1.6 Class or types of simple levers mechanism	State classes or types of simple levers mechanism	Lecturing and illustrations
		4.1.7 Centre of gravity or centre of mass	Explain centre of mass	Lecturing, discussions and illustrations

TASK		CRITICAL POINTS	SUB-POINTS	INSTRUCTIONAL TECHNIQUES
5.0	FRICTION	- Causes of friction - Frictional force - Advantages of friction - Disadvantages of friction - Co-efficient of friction - Calculate co-efficient of friction	• State causes of friction • Explain frictional force • Enumerate advantages of friction • State the disadvantages of friction • Explain co-efficient of friction • State the symbol of co-efficient of fraction	- Lecture and demonstration - Lecture and discussions - Lecture and discussions - Lecturing and discussions - Lecturing and illustrating - Lecture, illustrate and discussions
	APPLICATION OF FRICTIONAL LAWS	- Nature of surfaces - Magnitude of force applied - Nature of materials	• State the nature of surface • State the types of force applied • Elaborate on nature of materials from which the surfaces are made	- Lecturing and demonstrations - Lecture. Discussion and compare objects
6.0	MACHINES	Simple machines Types of simple machines Mechanical advantage Velocity ratio or movement ratio Efficiency of machines	Define the term simple machine List types of simple machines State the mechanical advantage and express it mathematically i.e. $M.A = \frac{\text{load}}{\text{Effort}} = \frac{W}{E}$ Explain what is velocity ratio or movement ratio in a mathematical form i.e. $V.R = \frac{\text{Effort}}{\text{Load}}$ Explain the efficiency with regard to machines Express efficiency in mathematical form i.e. $\text{Efficiency} = \frac{\text{Effort}}{\text{Load}} \times 100\%$	Lecturing, discussion and show real objects Lecturing, discussion and show real objects Lecturing and discussions objects Lecturing, illustration and discussions Lecturing, illustration and discussions

TASK		CRITICAL POINTS	SUB-POINTS	INSTRUCTIONAL TECHNIQUES
		Calculate problems involving mechanical advantage, velocity ratio or movement ratio and efficiency	Use mathematical formulas to calculate problems on topic as stated	Illustration and discussion
7.0	TRANSMISSION	Define the term transmission with reference to engineering	List types of transmission	Show real object and discussions
		Belt drive	State types of belt drive List advantages and disadvantages of belt drive	Real objects and discussions
		Gear drive	State the advantages and disadvantages of gear drive List types of gear drive	Lecturing and discussions Show real object
8.0	MOMENT	Unit of movement	Explain moment and its unit	Teach and illustrations
		Principles of movement	Explain the principles of moment	Lecturing and discussions
		Fulcrum	Explain the function	Teach, illustrations and discussions
		Reaction	Define reaction and illustrate in the real state	Illustrations and discussions
9.0	MECHANICAL ENERGY	Work	Explain: Work done and its unit Work done in cutting Work done in lifting	Lecture and illustrations
		Power	Explain: Power and its Unit Power and torque Power and cutting speed Power lost in friction Efficiency of machine	Teach, illustrations and discussions
		Torque	Define torque and give examples	Teach and show real object
		Forms of mechanical energy	Discuss these Mechanical Energy Potential energy	Illustrations and discussions

TASK		CRITICAL POINTS	SUB-POINTS	INSTRUCTIONAL TECHNIQUES
10.0	INDICES AND STANDARD FORM	10.1 Multiplication and division of index terms 10.2 Taking powers and roots of index forms 10.3 Fractional indices 10.4 Zero index and negative indices	Understand index, rules operation with index terms and use for simplify problems	Teach, discuss and demonstrate
11.0	ALGEBRAIC PROCESSES AND FACTORS	11.1 Addition and subtraction of algebraic terms 11.2 Multiplication and division of algebraic terms 11.3 Factors:- i) common factors and terms ii) difference of two square terms	Simple algebraic expressions using the methods to solve problems	Teach, illustrate and discuss
12.0	TRANSPOSITION AND EVALUATION OF FORMULAE	12.1 Transposing a given formulae to express it in terms of the required unknown 12.2 substituting given values in the formulae to solve the problems accurately	Solve problems which require the procedure or methods	Teach, illustrate and discuss
13.0	TRIGONOMETRY (TRIG)	13.1 Define trigonometry ratios, Sin, Cos, Tan, for any given 90^o triangle 13.2 State trigonometry ratios of common angles:- 0^o, 30^o, 45^o, 60^o, and 90^o 13.3 Use trigonometry tables to determine ratios of a given angle and the …… given ratio	Apply trigonometry ratios to solve problems related to angles	Teach, illustrate and discuss

TASK		CRITICAL POINTS	SUB-POINTS	INSTRUCTIONAL TECHNIQUES
		13.4 State and use the following theorem to solve problems: i) theorem of intersting chords ii) theorem of angles in segments 13.5 determine the trigonometry ratios and the two angles for any given ratio of angles between 0^o and 360^o		
14.0	SIMULTANEOUS EQUATION	Solve simultaneous e.g. by 14.1 Elimination solution 14.2 Substitution solution 14.3 Graphic solution	Identify various areas and solve problem related to trade area	Lecturing, Discussion and illustrate
15.0	QUADRATIC EQUATION	15.1 Functions 15.2 Equations 15.3 Factorization 15.4 Formula	Identify various areas and solve problem related to trade area	Lecture, Discussion and illustration
16.0	GEOMETRICAL CALCULATION	16.1 Volumes of cones 16.2 surface area of cones 16.3 Slant height of cones 16.4 Vertical height of cones	Solve problems which require the procedure or methods	Teach and show real objects

CERTIFICATE TWO-DRAWING

TASK		CRITICAL POINTS	SUB-POINTS	INSTRUCTIONAL TECHNIQUES
1.0	MACHINE ELEMENTS	Rivet and Rivet joint: • Springs • Undercuts • Gears • Studs • • Knurling	Identify types of rivet and rivet joints Identify types of undercuts, gears, studs, knurling. etc	Demonstration Demonstration
2.0	DIVES	• Belt • Coupling • Clutches	Identify types of belts, couplings and clutches	Demonstration
3.0	SURFACE FINISH	• Symbols for surface finish • Specification of finish • Class of finish	identify - symbols - specification - classes of finish	Demonstration after workshop visit
4.0	TOLERANCE	Dimensional tolerance Fitting tolerance Dimension from datum edges	Identify - dimensional tolerance - fitting tolerance - dimension from datum edges	Visit workshop and demonstration
5.0	FITS	ISO – symbols	Identify - ISO symbols - Drawing of shaft and bushing flanging assembly	Discussion and demonstration
6.0	STANDARD CONVENTION	- external screw threads - internal screw threads - screw threads assembly - splines shaft - serrated shaft - straight shafts - straight knurling - dimensional knurling - square on shaft - bearing - compression spring	Identify and Explain	Visit workshop and demonstrate

TASK		CRITICAL POINTS	SUB-POINTS	INSTRUCTIONAL TECHNIQUES
		- tension spring - interrupted views - repeated parts - hole on circle pitch		
7.0	ASSEMBLY DRAWING	Drawing of simple assembled component: - studs in housing - shaft in housing - bushing in housing - shaft in bearing - shaft in pulley	Explain simple assembly drawing and some various components	Visit workshop and demonstrate
8.0	SKETCHING SINGLE PARTS OUT OF AN ASSEMBLY DRAWING	Sketch single part out of an assembly drawing	Identify single part out of an assembly drawing	Visit workshop and demonstrate
9.0	DRAWING ABBREVIATION	- Across flat – A/F - British standard BS - Centre – CRS - Centre line – CL - Screwed - SCR	Explain and identify drawing abbreviations	Visit workshop and demonstrate
10.0	JOB PLANNING	Valuation Material for the job Measurement of the job Tools for the job	Explain Valuation Identify materials for the job Identify all measurements on the job Identify all the measuring tools for the job	Discuss and demonstrate
11.0	JOB PLANNING	Cutting tools	Identify all cutting tools for the job	Discuss and demonstrate
12.0	OPERATION	Operation Sequence	Identify operational sequence	Demonstrate operational sequence

TRADE PRACTICALS – CERTIFICATE TWO

TASK		CRITICAL SKILLS	SUB-SKILLS	INSTRUCTIONAL TECHNIQUES
1.0	SAFETY PRECAUTIONS	Applying safety precaution at the workshop Protective clothing Inflammable materials Hazardous materials Dangerous condition Dangerous parts of equipment in the workshop Operate fire extinguisher Machine guards Oil on the floor	Identify all safety tools and equipment at the work shop Explain the functions of safety tools and equipment at the workshop	Lecturing Discussion Demonstration
2.0	FASTENERS	Locate fasteners on equipments and tools Bolt and nuts Pins Tap washers Screws Keys Spring washer Lock nuts Slotted nut Castle nut c	Identify types of fasteners Diagnose for failure of fasteners Dismantle Replacement assemble	Lecturing Discussion Demonstration

TASK		CRITICAL POINTS	SUB-POINTS	INSTRUCTIONAL TECHNIQUES
3.0	POWER TRANSMISSION	Understand faulty power transmission system Gear drive Chain drive Belt drive	Identify types of power drive faults Clean the components Diagnose for the fault Dismantle the components Clean the parts Repair / change the parts Assembly parts Lubricate the system	Lecturing Discussion Demonstration
4.0	BEARING	Understand bearing faults	Identify types of bearing faults Clean the components Diagnose for the faults Dismantle the bearing Clean the bearing Repair/change bearing Lubricate bearing Assembly bearing	Lecturing Discussion Demonstration
5.0	SHAFT	Understand shaft fault	Clean the shaft Diagnose the fault Dismantle the parts Repair or change Assembly	Lecturing Discussion Demonstration

LEVEL – CERTIFICATE TWO – TEST SPECIFICATION TABLE
TRADE THEORY (OBJECTIVE)

NO	TOPIC	COGNITIVE KNOWLEDGE	AFFECTIVE UNDERSTANDING	PSYCHOMOTOR APPLICATION	TOTAL
1.	Safety	2	3	-	5
2.	Fasteners	2	3	-	5
3.	Bearings	2	3	-	5
4.	Lubrication	3	2	-	5
5.	Power transmission	2	3	-	5
		11	14	-	25

LEVEL – CERTIFICATE TWO – TEST SPECIFICATION TABLE
TRADE THEORY (SUBJECTIVE)

NO	TOPIC	COGNITIVE KNOWLEDGE	AFFECTIVE UNDERSTANDING	PSYCHOMOTOR APPLICATION	TOTAL
1.	Safety	1	2	2	5
2.	Fasteners	-	2	3	5
3.	Bearing	-	2	3	5
4.	Lubrication	-	2	3	5
5.	Power Transmission	1	2	2	5